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## Demographic Dividends for India: Evidence and Implications Based on National Transfer Accounts

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## ADB Economics Working Paper Series



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Laishram Ladusingh and M. R. Narayana

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# **Demographic Dividends for India: Evidence and Implications Based on National Transfer Accounts**

**Laishram Ladusingh and M. R. Narayana**  
December 2011

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## **Abstract**

There is a lack of verifiable evidence on the period and magnitude of the demographic dividends in India, a gap policy makers must address when setting priorities for human resource and capital investment to harvest the economic benefits of the demographic transition currently under way. This study attempts to fill this gap by quantifying the demographic dividends using National Transfer Accounts framework and by indicating their implications for equity. Our analysis projects that income per effective consumer could increase by 24.9% from 2005 to 2035—9.1% from the first demographic dividend and 15.8% from the second demographic dividend—and that the second dividend will be stable up to 2070. However, unless appropriate institutional reforms create an environment conducive to accumulating assets and raising productivity, India will find it difficult to meet the fiscal challenges posed by population aging.

## I. Introduction

The missing link in the debate on the impact of population on economic growth is the effect of age structure (Bloom and Williamson 1998). During the demographic transition from high fertility and high mortality to low fertility and low mortality, the age structure of the population undergoes unprecedented changes from a broad-based pyramid tapering at the top to a shrinking base with an enlarged middle and a gradually expanding top. The age structure of a population has economic ramifications as children and the elderly consume more than they produce while those in the prime working ages not only support their own consumption but also that of the economically dependent segments of society. Countries with shrinking numbers of children and large shares of working-age people can raise their rates of economic growth. This is referred to as the first demographic dividend or the window of economic opportunity (Lee and Mason 2006).

Bloom, Canning, and Malaney (2000) and Mason (2001) attributed East Asia's economic miracle to a major transition in the region's age structure. Using cross-country panel data, Bloom and Canning (2004) have shown a positive and significant relationship between the growth rate of the share of the working-age population and economic growth, but only if the economy is open. In studies based on Bloom, Canning, and Sevilla's (2003) approach, the ratio of the working-age population to total population, labor productivity, human capital, savings rate, trade policies and other variables determined the long-term growth of per capita income. An important result in these studies is the positive impact of the ratio of the working-age population, which captures the age structure transition. This offers empirical evidence for the positive impact of the demographic transition on economic growth. Further, they concluded that the potential for the demographic dividend can be realized in countries that can provide an environment for economic development. Mason (2006) suggested that each country in the Asia and Pacific region should act now to harvest the first demographic dividend.

In the later stages of the demographic transition, the working-age population starts declining and the relative share of the old-age population gradually increases; this stage of population aging can provide yet another avenue to boost the economies of developing countries. Lower fertility motivates saving in the prime working years of the economic life cycle to support old-age consumption and retirement security thus providing a second demographic dividend. Studies that have shown strong links between national savings rates and age structure include those by Fry and Mason (1982); Mason (1988); Higgins (1998); Kelley and Schmidt (1996); Deaton and Paxson (1997); Lee, Mason, and Miller (2000 and 2001); and Bloom et al. (2007).

The National Transfer Accounts (NTA) developed by Mason et al. (2006) offer a systematic approach to introducing age into national income and product accounts (NIPA) to describe intergenerational flows of resources in an economy. This approach defines the growth rate of per capita income as a product of labor productivity and the support ratio where the support ratio is equal to the ratio of effective producers to effective consumers. Support ratios are computed from the age profiles of aggregate labor income and consumption. Furthermore, the approach distinguishes between the economic benefits from the first demographic dividend—the positive impact of the growth of the support ratio on the growth rate of per capita income given productivity—and the second demographic dividend—positive economic growth from accumulating wealth and from capital deepening. Mason (2005) obtained estimates of the first and second demographic dividends for a number of countries and suggests potentially varied dividends in terms of timing, duration, and magnitude. Studying demographic dividends in the context of East Asian economic development with an emphasis on Japan, Mason and Kinugasa (2008) made the observation that in countries that encourage capital accumulation as a means of meeting retirement needs, aging can serve as a fundamental force for creating a wealthier and more prosperous society. Ogawa et al. (2009) associated Asia's changing demographic landscape with the first and second demographic dividends.

The economic implications of the growing working-age population in India have been the focus of studies by Navaneetham (2002), Lal (2006), Chandrasekhar et al. (2006), James (2008), and Desai (2010). Navaneetham did a regression analysis of the growth rate of the gross domestic product (GDP) on changes in the share of different age cohorts in the population by controlling for selected macroeconomic indicators. The sample comprised eight South and Southeast Asian countries including India from 1960 through 1990. The results were varied; in India, however, none of the estimated coefficients was statistically significant. Lal did a regression analysis of GDP growth rates and found that age structure had an impact, but the theoretical framework was not adequate to reveal the first and second demographic dividends. Chandrasekhar et al. provided supportive evidence for the need to enhance employability in terms of educational attainment and health care in order to take advantage of the windows of the opportunity offered by the transition in the age structure. James described prerequisites for harvesting demographic dividends and found a positive association between the growth of the working-age population and household savings but did not provide estimates of demographic dividends citing methodological challenges and a lack of adequate data. Desai looked at the labor force participation rates of women by years of schooling and household income quintile and inferred that India is unlikely to realize its demographic dividends to the fullest extent unless significant strides can be made to increase their participation.

In general, these studies refer to economic factors that influence the realization of demographic dividends but do not provide a basis for estimating and analyzing those dividends. Recently, Aiyar and Mody (2011) assessed the dividend in various Indian states; Choudhry and Elhorst (2010) looked at the demographic transition and economic



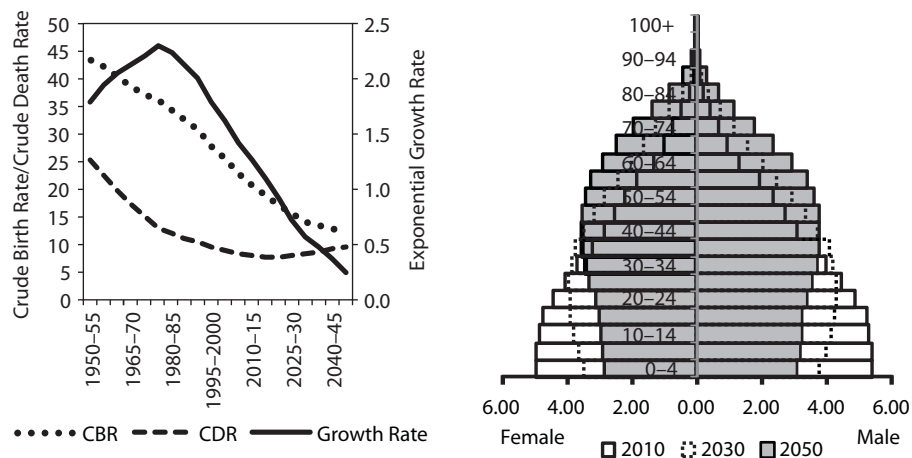
growth in the People's Republic of China (PRC), India, and Pakistan; and Bloom et al. (2010) studied the effects of population health and demographic change in the PRC and India.

Policy makers have highlighted India's advantageous age structure in recent public documents. For instance, the Eleventh Five Year Plan (Government of India, Planning Commission 2008, 90) emphasizes that India will have "...a unique 25-year window of opportunity called India's demographic dividend". Demographic dividends have also become the subject of researchers, but no quantitative estimates are available, and the stated period of the window of opportunity is not supported by empirical or any other sort of evidence. This lack of verifiable evidence on the period and magnitude of the demographic dividends is a gap policy makers must address when setting priorities for human resource and capital investment to harvest the economic benefits of the demographic transition. Using NTA, this study is an attempt to fill this gap by quantifying the demographic dividends for India and by indicating their implications for equity issues.

## II. The Demographic Transition in India

The preliminary results of the 2011 census set India's total population at 1.21 billion (Government of India, Office of the Registrar General of India 2011), an increase of 180 million over last 10 years. By 2026, the projected total population will be 1.40 billion mainly due to (a) an increase in life expectancy at birth for males and females from 65.8 and 68.1 years, respectively, in 2006–2010 to 69.8 and 72.3 years in 2021–2025; and to (ii) a decline in the total fertility rate (TFR) from 2.6 to 2.0. The annual exponential growth rate was above 2% between the late 1970s and the mid-1980s—the period of the greatest decline in the death rate while the birth rate was still 30 per 1,000 population.

The implications of the demographic transition on age structure are evident for the population under 20 years of age as the share in the total population of this age group fell from 51% in 1970 to 41% in 2010 and is projected to decline to 22% in 2050. At the same time, the share of the total population under age 60 marginally increased from 5.5% in 1970 to 8% in 2010 and is projected to reach 22% in 2050. The large decline in the share of the population under 19 years of age has been associated with a substantial rise in the proportion of the working-age population (19–59 years) from 43% to 51% from 1970 to 2010 and is projected to be a maximum of 56% in 2045. Figure 1 shows the demographic and age structure transition in India.

**Figure 1: Demographic and Age Structure Transition in India**

CBR = crude birth rate, CDR = crude death rate.

Source: Constructed from *United Nations World Population Prospects: The 2008 Revision* (United Nations 2008).

It is evident that the age structure of India's population is likely to undergo remarkable transitions leading to a decline in the relative share of children and an increase in the share of the elderly and working-age populations.

India is often considered as a collection of many countries held together by a common destiny, thus this overall scenario conceals regional variations across states. The north-south demographic divide in terms of pace of fertility and mortality declines and age-structure transition has been the focus of Bose (1996 and 2006); Bhat (2001); Visaria and Visaria (2003); Mitra and Nagarajan (2005); Bose, A. B. (1996); Chandrasekhar et al. (2006); Aiyar and Mody (2011); and Dyson (2010). Table 1 shows key demographic indicators and age structure transitions in major states. It is evident that there is a convergence in mortality in terms of annual deaths per 1,000 with figures in single digits for all states and in life expectancy at birth ( $e_0^0$ ), which is highest in Kerala at 74 years, and lowest in Madhya Pradesh at 58 years, while most of the major states have crossed the 60-year threshold. However, the demographic gap among states in terms of annual births per 1,000 population and annual infant mortality per 1,000 live births is glaring.

**Table 1: Demographic Indicators and Age Structure Transition in Major States in India**

States	Demographic Rates (2009)			eoo (2002– 2006)	Age Composition (%)			
	BR	DR	IMR		1971		2026	
					15–59	60+	15–59	60+
Andhra Pradesh	18.3	7.6	49	64.4	51.7	5.3	65.5	14.2
Assam	23.6	8.4	61	58.9	48.4	4.7	64.9	11.0
Bihar	28.5	7.0	52	61.6	51.5	5.9	64.1	11.2
Gujarat	22.3	6.9	48	64.1	51.7	5.3	65.4	13.7
Haryana	22.7	6.6	51	66.2	48.0	5.8	67.0	11.4
Himachal Pradesh	17.2	7.2	45	67.0	51.6	7.2	65.5	14.7
Tamil Nadu	16.3	7.6	28	66.2	56.5	5.7	64.2	17.1
Kerala	14.7	6.8	12	74.0	62.6	6.2	63.0	18.3
Madhya Pradesh	27.7	8.5	67	58.0	50.5	5.8	63.6	11.0
Maharashtra	17.6	6.7	31	67.2	52.9	5.7	65.7	12.9
Orissa	21.0	8.8	65	59.6	51.6	6.0	65.1	13.8
Uttar Pradesh	28.7	8.2	63	60.0	46.1	6.8	61.3	9.8
West Bengal	17.2	6.2	33	64.9	51.7	5.3	65.4	14.2

BR = birth rate, DR = death rate, eoo = life expectancy at birth, IMR = infant mortality rate.

Sources: Demographic rates (2009) are from the Office of the Registrar General of India (2011); life expectancy at birth is from the Office of the Registrar General of India (2008); age composition in 1971 is from the Office of the Registrar General of India (1997); and age composition in 2026 is from the Office of the Registrar General of India (2006).

In 1971 there was variation among states in the percentage of the population in the 15–59 and 60 and older age groups, but this seems to gradually converge in 2026, smoothing out regional differences. Thus in the long run in the later stages of the demographic transition, the relative sizes of the working-age and elderly populations in the national aggregate are unlikely to conceal regional differences.

### III. Economic Growth and Social Policies

The history of economic growth in India was disappointing for more than a quarter of a century. During the 1950s, GDP grew at nearly 4% annually, but from 1965 to 1975 the average dipped to just 2.6%. With the population growing at 2.3% per annum, this meant a per capita income growth rate of just 0.3% (Panagariya 2008). Bhagwati (2007) noted that the weak growth performance during that period and the doubling of the savings rate was due to disappointing productivity. The late 1960s and the 1970s are widely considered as a period of stagnation largely due to decelerating industrial growth. To bail out the economy, the government began to introduce fiscal incentives and to liberalize imports removing licensing restrictions for selected industries and rationalizing tariffs. India then moved from a path characterized by a “Hindu rate of growth” of below 3% to a credible level of 5%–6% annually in the early 1980s. Individual states determined tax reductions, deregulation, and other policies.

In 1991, the economy suffered a severe balance of payments crisis, a deceleration in agricultural output, and uneven performance in manufacturing (Table 2). The government undertook major economic reforms including establishing the private sector's role as a leading engine of growth; placing greater reliance on market forces; and opening the economy to international trade, foreign investment, and foreign technology (Ahluwalia 2005). These fiscal responses to the crisis were major liberalizations on both the domestic and international fronts (Panagariya 2008) that helped accelerate the GDP growth rate to 7.8% in 1996–1997 and then maintain it at an average of approximately 6% thereafter.

**Table 2: India's Sector Growth Performance, 1970–2002**

	Total GDP Growth (%)	Sector Growth of GDP (% per year)		
		Agriculture	Industry	Services
1970–1972 to 1980–1981 (average)	3.2	2.0	4.0	7.2
1981–1982 to 1990–1991 (average)	5.7	3.8	7.0	6.7
1991–1992	1.3	–1.1	–1.0	4.8
1992–1993	5.1	5.4	4.3	5.4
1993–1994	5.9	3.9	5.6	7.7
1994–1995	7.3	5.3	10.3	7.1
1995–1996	7.3	–0.3	12.3	10.5
1996–1997	7.8	8.8	7.7	7.2
1997–1998	4.8	–1.5	3.8	9.8
1998–1999	6.5	5.9	3.8	8.3
1999–2000	6.1	1.4	5.2	9.5
2000–2001	4.0	0.1	6.6	4.8
2001–2002	5.4	5.7	3.3	6.5
1992–1993 to 1996–1997 (average)	6.7	4.6	8.0	7.6
1997–1998 to 2001–2002 (average)	5.4	2.3	4.5	7.8

GDP = gross domestic product.

Note: Growth rates for 2001–2002 are projections of the Ministry of Finance based on partial information.

Source: Economic Survey 2001–2002 (Government of India, Ministry of Finance 2002).

Since the structural changes in 1991, the economy as a whole is much more integrated with that of the rest of the world—the current account is fully open while the capital account is substantially so (Acharya and Mohan 2010). Furthermore, the change has been marked by remarkable macroeconomic and financial stability. The link between economic growth and poverty alleviation in India is, however, not so clear in view of the persistence of widespread poverty; the inability of the government to ensure the basic needs of housing, sanitation, adequate health care, and universal education; and the poor quality of education. When it comes to international comparisons of public expenditures on health as a percentage of GDP, India is near the bottom. Expenditures on health were 1.23% of GDP even in 2004–2005 and remain at this level to date as shown in Table 3. As part of the National Rural Health Mission: 2005–2012, the government has proposed raising public expenditures on health to 2% to 3% of GDP. The private sector has helped to fill some of the vacuum left by the public sector.

**Table 3: Trends in Social Service Expenditures by Governments in India, 2005–2011 (central and state governments combined; in 10 million rupees)**

Items	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011
	Actual	Actual	Actual	Actual	(RE)	(BE)
Total Expenditure	959,855	1,109,174	1,316,246	1,595,110	1,909,380	2,071,147
	202,672	239,340	294,340	380,269	476,351	522,492
Expenditures on Social Services						
i) Education	96,365	114,744	129,366	161,360	204,986	235,035
ii) Health	45,428	52,126	63,226	73,898	90,700	99,738
iii) Others	60,879	72,470	101,992	145,011	180,665	187,719
	<b>As Percent of GDP</b>					
Total Expenditures	25.99	25.83	26.40	28.57	29.15	26.29
Expenditure on Social Services	5.49	5.57	5.91	6.81	7.27	6.63
i) Education	2.61	2.67	2.59	2.89	3.13	2.98
ii) Health	1.23	1.21	1.27	1.32	1.38	1.27
iii) Others	1.65	1.69	2.05	2.60	2.76	2.38

BE = budget estimate, GDP = gross domestic product, RE = revised estimates.

Source: Economic Survey 2011 (Government of India, Ministry of Finance 2011).

Education is a concurrent subject in the Indian constitution, which means that both the state and the central governments can legislate in this area. In its public statements, the government is committed to raising public expenditures for education to 6% of GDP from the current level of 2.6% set in 2005–2006.

There are six pension benefit schemes in India: civil service, employees provident fund organization, public sector enterprises, occupational pension or superannuation, voluntary tax advantage savings, and the unorganized sector. Under the civil service schemes, employees of central, state, and local governments are entitled to receive noncontributory, unfunded, defined benefit pensions on retirement as well as contributory provident funds and lump sum gratuity payments based on length of service. Provident fund schemes finance retirement pensions for workers in the organized, nonpublic sector. The public sector enterprise scheme is a contributory pension system largely for employees in insurance companies, the Reserve Bank of India, public sector banks, electricity boards, and oil companies, and is managed by the enterprises concerned. Occupational pension schemes are employer-sponsored, and are largely defined contribution schemes that are not statutory, which provide additional postretirement income to employees on a regular basis. The liabilities are met by setting up trust funds. Voluntary tax advantage schemes are small savings schemes with incentives for tax rebates. The unorganized sector schemes serve the poor through social assistance programs at both the central and state levels (Asher 2006).

The 1950s and 1960s witnessed the launch of public assistance schemes by state governments for persons facing virtual destitution. The then undivided state of Uttar Pradesh was the first to introduce an old-age pension scheme in 1957. Other states then introduced old-age pension schemes, but the timing varied (Bose, A. B. 2006).

1960–1969: Andhra Pradesh, Chandigarh, Haryana, Himachal Pradesh, Karnataka, Kerala, Punjab, Rajasthan, Tamil Nadu, West Bengal

1970–1979: Bihar, Dadra and Nagar Haveli, Delhi, Goa, Daman and Diu, Gujarat, Lakshadweep, Madhya Pradesh, Mizoram, Nagaland, Orissa, Tripura

1980–1989: Andaman and Nicobar Islands, Assam, Maharashtra, Manipur, Meghalaya, Pondicherry, Sikkim

The pension systems were not backed by statutory rights granted to the elderly; rather, they were established by administrative orders and were therefore discretionary in character. State governments have determined the criteria for old-age pensions based on minimum ages ranging from 60 to 70 years for domiciled residents (usually for 3 or 4 years), and restricted to the destitute defined as persons not capable of doing remunerative work with no source of income, no assets, and no family members/relatives to support them. The Seventh Finance Commission (1979–1980 to 1983–1984) took a more liberal view and recommended that the ceiling for old-age pensions be raised to 60 rupees (Rs) per month from the Rs25 to Rs45 that the states were paying. The number of persons eligible for old-age pensions was restricted to 0.1% of the total population.

Till the middle of Ninth Plan (1992–1997), old-age pension schemes were treated as the sole domain of state governments. In 1995 the national government launched the National Old Age Pension as a major component of the National Social Assistance Programme, but it was not meant to take over state responsibilities. Under the national scheme, the central government pays beneficiaries older than 65 years of age Rs75 per month.

In view of the growing concerns regarding inadequate old-age income security and financial provisions for retirement, in 1999 the government commissioned the Old Age Social and Income Security report to examine policy questions. The focus of the report, which was submitted in January 2000 was the unorganized workforce, and the key features and recommendations were the following:

- (i) Establish a new pension system based on the concept of individual retirement accounts (IRAs).
- (ii) Individuals should be able to access and operate IRAs from “points of presence” to be located all over the country. These could include bank branches and post offices among others.
- (iii) Professional fund managers should be appointed to manage the funds. The committee also recommended a choice of three types of funds: safe income, balanced income, and growth.

- (iv) There should be a cap on administrative and fund management costs, and a limited number of managers should be selected potentially based on competitive bidding on overall charges.
- (v) On reaching retirement age, individuals would be required to convert the balance in their IRAs into regular pensions. The pension annuity would be purchased from a life insurance company.

## **IV. Demographic Dividends in the National Transfer Accounts Framework**

India is a federal economy so revenue and expenditure functions and regulatory functions are divided among central, state, and local governments.. As per the constitution, government activities are assigned to the union list, the state list, or the concurrent list. Social sectors such as education, health, and social security are included in the concurrent list; hence, both the national and state governments have regulatory functions in these sectors, and their combined expenditures and consumption are relevant for NTA purposes.

The economic system of India is characterized by the coexistence of the public and private sectors in the production and consumption of goods and services, including ownership, management, and financing of social and economic sector activities. This implies that NTA public and private sector frameworks are relevant. Furthermore, India is an open economy because its borders are open for international trade in goods and services as well as for international production (e.g., labor and capital). In fact, an increase in openness has been an important factor in the globalization of the Indian economy. Thus, external account transactions are of importance for India's economic growth, which implies that the NTA open economy approach to estimating aggregate control variables is relevant.

The total dependency ratio—the ratio of children and the elderly to the working-age population—is conventionally used to capture the economic implications of a changing age structure. This is a purely composite indicator and does not reflect variations in values of earnings and consumption by age. This limitation is overcome in the NTA based on the economic life cycle approach (Mason et al. 2006). The economic life cycle of an individual is characterized by the age pattern of labor income and the consumption of private and public goods and services, and typically shows that populations concentrated in working ages can support a higher level of consumption than populations concentrated in the dependent ages for whom consumption exceeds income. This life cycle deficit (LCD) of the dependent age groups is financed by age reallocations in terms of

intergenerational transfers and asset-based reallocations. The NTA flow account identity, consistent with the national income identity, provides an empirical basis for computing LCDs and age reallocations.

In the NTA framework, the first demographic dividend is quantified and assessed in terms of the economic support ratio (ESR) or ratio of effective number of producers (L) to effective number of consumers (N). That is,

$$L/N = \sum_{a=0}^w \gamma(a)P(a, t) / \sum_{a=0}^w \phi(a)P(a, t) \quad (1)$$

where,  $P(a, t)$  is the population aged  $a$  at time  $t$ , and  $\gamma(a)$  and  $\phi(a)$  are the age patterns of labor income and consumption, respectively. The age patterns of labor income and consumption—the parameters of the economic life cycle in the definition of the ESR—clearly have an edge over ad hoc measures such as the total dependency ratio. A standard measure of the economic growth of an economy is income per capita and can be decomposed as

$$Y/N = (L/N) * (Y/L). \quad (2)$$

It is a measure of per capita income adjusted for age variations in consumption and is a product of the ESR and income per worker, i.e., labor productivity. Income per effective worker is intended to capture many factors such as level of technology, human and physical capital, natural resources, and political and economic institutions (Lee and Mason 2007). In growth terms, we have

$$gr(Y/N) = gr(L/N) + gr(Y/L) \quad (3)$$

where  $gr$  stands for growth rate. Given productivity, the period of the positive growth rate of the ESR in the demographic transition is the first demographic dividend.

The first demographic dividend is transitory and phases out with increases in the elderly population and fewer births to replace the working-age population in the later stages of the demographic transition. The prospect of a second demographic dividend depends on two main factors. First, some of the economic benefits of the first demographic dividend are likely to be invested in human capital through intergenerational transfers and capital deepening. This will lead to an increase in output per worker. Second, the prospects of a longer life and an extended period of retirement will motivate individuals to save and accumulate more wealth. Savings and wealth accumulation for consumption in retirement intensifies with fewer children to support due to fertility declines. In the near absence of an adequately funded public transfer program in India to support retirement, the demand for wealth may undoubtedly rise in the years to come.

Several empirical studies following Yaari (1965) have provided evidence that an increase in life expectancy leads to a higher savings rate (Zilcha and Friedman 1985, Yakita 2001,



Bloom et al. 2003, Kageyama 2003, and Kinugasa 2004). This accumulation of wealth to finance future consumption in excess of future labor income can lead to a second demographic dividend (Mason 2005). Computing the second demographic dividend in India in this paper follows the macroeconomic framework and simulation approach in Lee and Mason (2007). In this framework, the second demographic dividend is analyzed in terms of the income index  $(y/\bar{y}^l)$  and the consumption index  $(c/\bar{y}^l)$ . The income index is income per equivalent consumer relative to income, and the consumption index is the consumption per equivalent consumer relative to income per equivalent consumer. Equivalent consumer is the adult equivalent number of consumers in the population. The two indices measure the extent to which income and consumption per equivalent consumer rise relative to income under the assumption that productivity changes due to technological innovations only. If individuals save and accumulate assets during the demographic transition, the income and consumption indices would behave exactly as the ESR does. In the later stages of the transition, however, with fewer children to support and the near absence of publicly funded support in India, people have to save during their working lives to finance consumption after retirement. This makes the indices of income and consumption different and higher than the ESR in the real world. The second demographic dividend measured in growth terms is the difference between the rate of growth of the income index or the consumption index and the rate of growth of the ESR.

## A. Data Requirements, Sources, and Assumptions

Age patterns of consumption of public and private goods and services and labor income have to be consistent with NIPA. Macro aggregate controls for consumption of public and private health, education, and other services for the financial year 2004–2005 were compiled from the national account statistics (Government of India, Central Statistical Organisation 2008). Macro aggregate controls for labor income are the sum of compensation for employees (including net compensation of employees from the rest of the world) and mixed income. The aggregate controls in 2004–2005 are given in Table 4.

**Table 4: Macro Aggregate Controls for Labor Income and Consumption by Sectors in India, 2004–2005 (10 million rupees)**

Consumption by Sector	Public	Private	Total
Education	60505	38221	98726
Health	74441	80895	155336
Others	184152	1537401	1721553
Macro-Control for Labor Income			1546099

Source: National account statistics 2008 (Government of India, Central Statistical Organisation 2008).

Micro data on labor income and the consumption of health, education, and services (e.g., food, nonfood, housing, infrastructure) in the public and private (household) sectors are required for charting age patterns of labor income and consumption by sector in the Indian economy. The India Human Development Survey (Desai et al. 2008) conducted in 2004–2005 is the source of micro data on labor income from wages, salaries, and self-employment and household expenditures on education, health care, food, nonfood

items, house rent, money borrowed, household credit, enrollment status of children by public/private educational establishments, and treatment of individuals for minor and major illnesses. The survey is nationally representative covering 200,000 individuals from over 41,000 households spread over 1503 villages and 971 urban neighborhoods using a multi-stage, stratified sampling design adopted specifically for it. The medium variant projections of the United Nations (UN) for India were the source for age structure transitions and the basis for quantifying the demographic dividends (United Nations 2008). The UN projection assumed a decline in the TFR to 1.85 and in the infant mortality rate to 23 and an improvement in life expectancy to age 77.9 by 2050.

The basic data used in the simulation exercise were age patterns of per capita consumption and labor income. For this simulation we assumed that two thirds of children's costs were supported by familial transfers and that one third were met through public transfers. Additionally, we assumed that the share of familial intergenerational transfers and public transfers to support the population aged 60 and older was constant during the simulation period, that there was a risk-free discount rate of return of 3%, a depreciation rate of 3%, and a rate of return of 6% on assets declining linearly to a steady-state interest rate of 4.42 % in 2300. These assumptions are broadly in line with NTA results on intergenerational transfers (Ladusingh and Narayana 2011) and with the macroeconomic parameters of economies that experienced demographic dividends in the course of their demographic transitions (Mason 2006).

## **B. Economic Life Cycle**

The age profile of per capita labor income shown in Figure 2 reflects a number of distinctive features. It is an inverse, broad U-shaped curve that shows that earning potential is low at early ages, that labor income increases steeply till about 35 years of age then steadily increases between 36 and 59 years of age, and thereafter declines rapidly with advancing age. The existence of child labor is apparent with the early age of entry into the workforce and marginal share of labor income of young persons. The tapering income profile of the elderly is indicative of their low wages as many are self-employed farmers, or work in the informal sector.

**Figure 2: Economic Life Cycle for India, 2004–2005**

INR = Indian rupees.

Source: Authors' calculations.

The age pattern of per capita consumption is the combined profiles of per capita consumption of education, health care, and services computed separately by public and private contributions (Ladusingh and Narayana 2009 and 2011). The profile also exhibits interesting features, particularly for school-age consumers and at older ages. Per capita monthly consumption increases sharply from about 4 years of age till it attains an early peak at about 19 years, showing a huge investment in education; and continuing to increase up to 26 years, the age of completion of education. The consumption profile crosses the income profile at 25 and 60 years of age, which mark the average ages of entry into the labor force and of retirement, respectively. During the 35 years of economically gainful activities, per capita consumption rises concomitantly with the rise in per capita labor income and continues to rise even postretirement due to health care costs, but then drops in the very old age groups. This implies that retirement does not compel individuals to curtail consumption because the bulk of employment is in informal sectors with no formal age of retirement. An important, noticeable feature of the age pattern of per capita consumption is that the elderly support an average consumption nearly at par with that of those in the prime working ages. This suggests intergenerational equity, and is also a reflection of reallocations of resources across age groups through savings and liquidating income and assets.

## C. The Life Cycle Deficit and Intergenerational Reallocations

The LCD of persons younger and older than working age occurs because they consume more than they produce; it is covered through private (interhousehold and intrahousehold) transfers, public transfers in cash or in kind net of taxes, and private and public asset-based reallocations.

**Table 5: Aggregate Labor Income, Consumption, Life Cycle Deficits, and Age Reallocations by Decades in India, 2004–2005 (10 million rupees)**

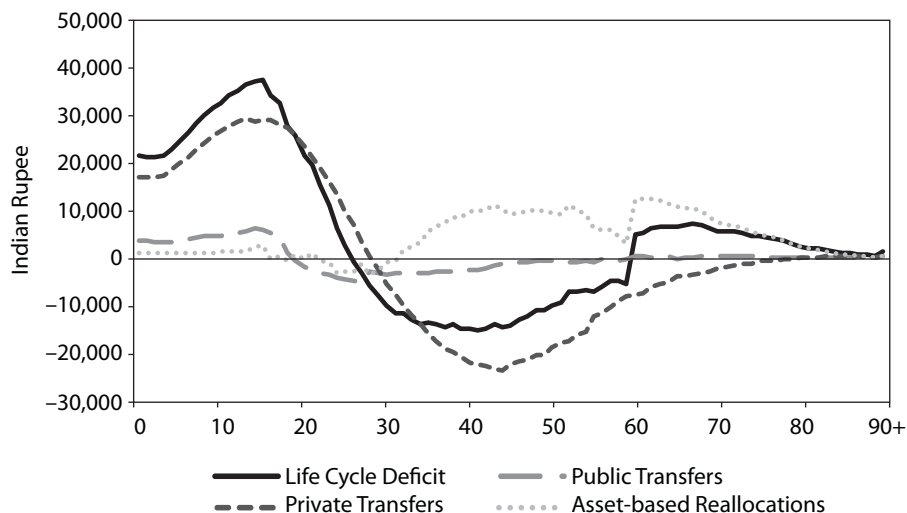
	Total	0–19	20–29	30–49	50–64	65+
Life Cycle Deficit	429,516	583,062	58,499	–267,329	–39,687	94,971
Consumption	1,975,615	640,114	377,019	572,539	256,732	129,211
Public	319,098	159,705	41,492	66,958	32,177	18,766
Education	60,505	58,905	1,600	0	0	0
Health	74,441	20,737	7,742	21,931	14,292	9,739
Other	184,152	80,063	32,150	45,027	17,885	9,027
Private	1,656,517	480,409	335,527	505,581	224,554	110,446
Education	38,221	31,798	6,423	0	0	0
Health	80,895	12,767	8,678	26,271	19,584	13,595
Other	1,537,401	435,844	320,426	479,310	204,971	96,851
Labor Income	1,546,099	57,052	318,520	839,868	296,419	34,240
Age Reallocations	429,516	583,062	58,499	–267,329	–39,687	94,971
Asset-Based Reallocations	395,527	20,038	–16,922	142,122	135,357	114,932
Net Asset-Based Income	1,067,028	46,986	151,226	440,934	257,469	170,414
Less: Net Savings	671,501	26,948	168,148	298,811	122,112	55,482
Public Transfers	0	81,138	–35,904	–45,406	–5,006	5,178
Private Transfers	33,989	481,886	111,325	–364,045	–170,038	–25,139
Inflows	1,213,290	498,342	246,997	264,478	122,272	81,200
Outflows	–1,179,301	–16,456	–135,672	–628,523	–292,310	–106,339
Interhousehold	33,989	2,705	4,952	10,695	8,894	6,743
Inflows	36,458	2,829	5,401	11,685	9,518	7,025
Outflows	–2,469	–124	–449	–990	–625	–282
Intrahousehold	0	479,181	106,372	–374,740	–178,932	–31,882
Inflows	1,176,832	495,514	241,596	252,793	112,754	74,176
Outflows	–1,176,832	–16,332	–135,224	–627,533	–291,685	–106,058

Source: Authors' calculations.

Table 5 shows labor income, public and private consumption by sector, LCD, public and private transfers, and asset-based reallocations by decade for accounting year 2004–2005. The consumption of private and public health, education, and services by persons under 30 years of age and 65 years and older exceeds their labor income. These two age groups, respectively, make up 51.5% and 6.5% of total consumption. The opposite is true for people in the working-age groups 30–49 and 50–64 years. Those aged 30–64 years accounted for 42% of total consumption. Children and the elderly mainly consume education and health care, respectively.

The existence of child labor and the continuation of economically gainful activities by the elderly emerge from the fact that the contributions of children under 20 years of age and of the elderly 65 years and older to total labor income were 3.7% and 2.2%, respectively.

**Figure 3: Aggregate Life Cycle Deficit, Asset-Based Reallocations, and Private and Public Transfers in India, 2004–2005 (Indian rupees)**



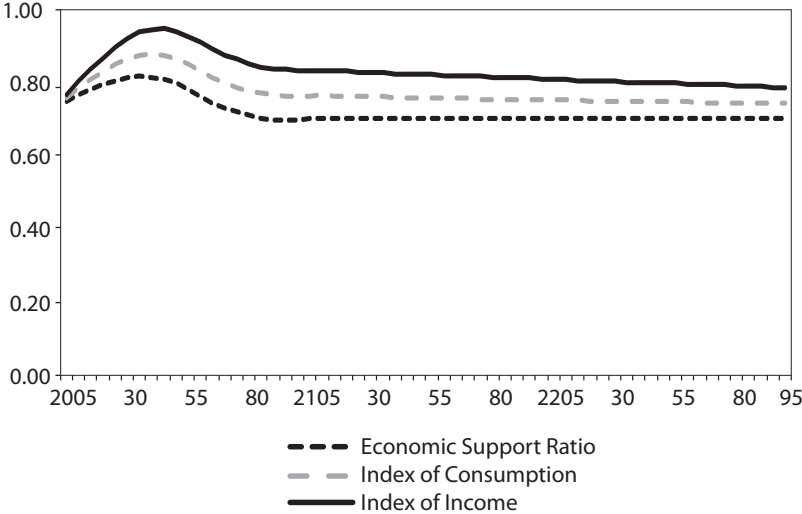
Source: Authors' calculations.

Figure 3 indicates that intergenerational public and private transfers and asset-based reallocations are the primary means of financing the LCD of children and the elderly. Private transfers, particularly intrahousehold from members with disposable income and assets, are very important in India. Private and public transfers accounted for 82.6% of intergenerational reallocations to support the LCD of the population under 20 years of age. Contrary to popular belief, the elderly in India do not get monetary support to finance their LCD from their children and/or grandchildren. The net private transfer for those 65 years and older is negative indicating that they themselves are supporting the LCD of other household members. Public transfers to children under 20 years of age and to people 65 years and older accounted for 14% and 5.5% of their respective LCDs. The aggregate net public transfer is zero as revenues from taxes, interest, and services balance out expenditures. The elderly finance their own LCDs largely from asset-based reallocations.

## V. Demographic Dividends

In the NTA framework, the first demographic dividend is quantified in terms of the ESR while the second dividend is studied in terms of the income index ( $\frac{y}{yl}$ ) and consumption index ( $\frac{c}{yl}$ ) described in the preceding sections. The key inputs for the simulation to generate the ESR and indices of income and consumption are the age patterns of labor income and consumption depicted in the economic life cycle in Figure 2.

**Figure 4: Economic Support Ratio, Consumption Index, and Income Index for India, 2005–2295**



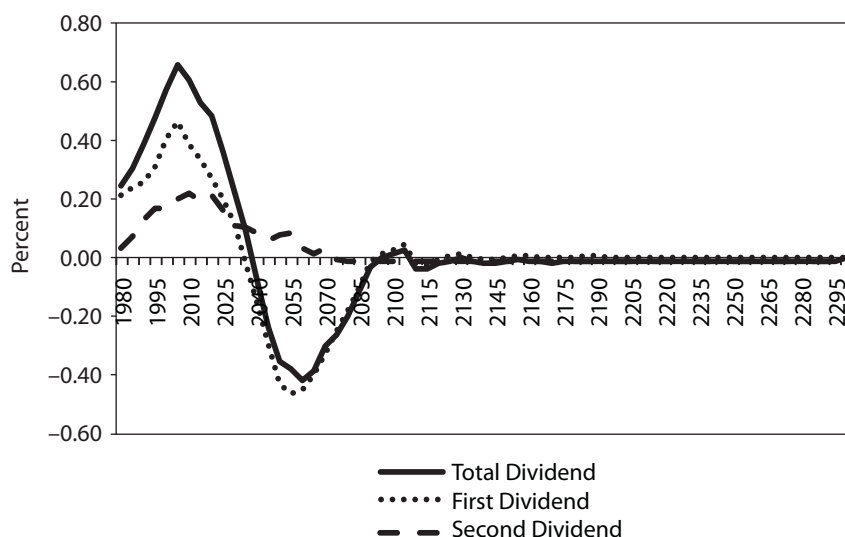
L/N = economic support ratio, c/yl = consumption index, y/yl = income index.  
Source: Authors' calculations.

Figure 4 shows trends in the estimated values of ESR ( $L/N$ ), the income index ( $\frac{y}{yl}$ ), and the consumption index ( $\frac{c}{yl}$ ). The trend for the ESR is positive and rises till 2035, indicating an increase in the number of effective workers per effective number of consumers. It increases from a value of 0.750 in 2005 to 0.819 in 2035, registering an annual increase of 0.51%. It is thus evident that there is rapid economic growth during the later working ages in the middle stage of the demographic transition. The first demographic dividend results in an increase in income per effective consumer by 9.1% in India from 2005 to 2035 given the age patterns of labor income and consumption shown in Figure 2. The transitory nature of the first demographic dividend is evident from the declining trend in the ESR after 2035, the starting point of the dwindling working-age population and the gradual increase in the share of the elderly population. The effective number of workers per effective consumers starts declining in 2035 from its peak but still remains above its level in 2005 till 2070.

In order to chart savings and asset accumulation—the key factors in the second demographic dividend—we compared the trend in the income and consumption indices with that of the ESR. The levels were more or less the same in 2005, but after this point the income and consumption indices rose more sharply than the ESR, and the gap between them was pronounced. The gap between the consumption index and the ESR was 1% in 2005 and widened to 6% in 2035, and the annual increase in the consumption index during the period was 0.51%. The consumption index continued to remain above the ESR throughout the demographic transition. Had there been no second demographic dividend, the ESR and the consumption index would have been the same as there would have been no rise in income per effective consumer, and the economy would have been devoid of capital deepening by way of asset accumulation and savings. The reason for the higher values of the consumption index even after the first demographic dividend phases out is that people are able to support higher levels of consumption as a consequence of increased income per effective consumer. This way the transitory first dividend is converted into a permanent second dividend that contributes an increase of 15.8% in income per effective consumer during the transition period 2005–2035. The gain in income per effective consumer from both the first and second demographic dividends during this period is thus 24.9%.

The second demographic dividend measured in growth terms is the difference between the rate of growth of the income index ( $\frac{y}{y_l}$ ) or the consumption index ( $\frac{c}{y_l}$ ) and the rate of growth of the ESR (Lee and Mason 2007). Figure 5 shows trends in the growth rates from the first, second, and total demographic dividends. The growth rate of the ESR turns negative in 2035, indicating the phasing out of the first demographic dividend. At this stage while the ESR begins to decline and turn negative, the second demographic dividend with some overlapping remains positive. The peak in the growth rate of the second dividend is attained when the growth rate of the first dividend starts declining for the reasons highlighted above. When the first demographic transition phases out in 2035, the annual rate of growth of the ESR becomes negative.

**Figure 5: Annual Growth Rate of Demographic Dividends in India, 1980–2295 (percent)**

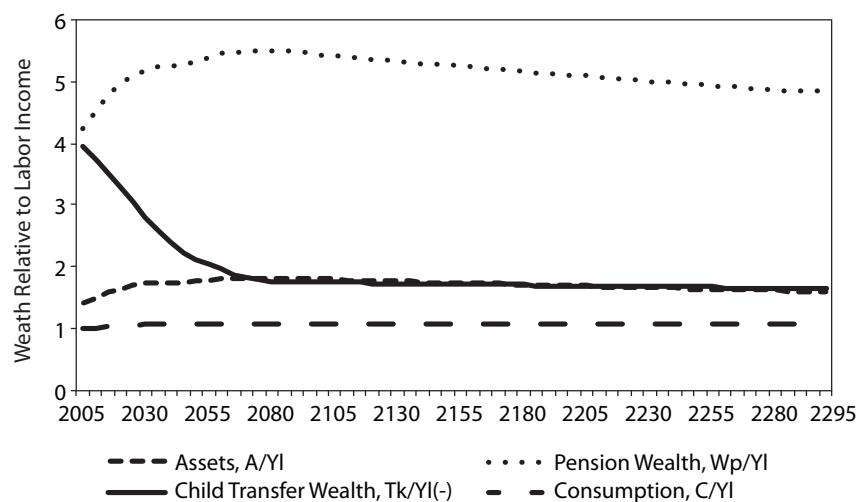


Source: Authors' calculations.

The annual rate of growth of the second demographic dividend exceeds that of the first in 2035 and remains positive until it hits zero in 2070. On the whole, income per equivalent consumer increases by 44.7% from 1980 to 2035. As the second demographic dividend gains momentum when the first demographic dividend starts phasing out, the contribution of the second dividend is expected to dominate, particularly after 2040. These results closely correspond to those for Asia in UN calculations (2007). Using the NTA framework to study the demographic transition and changing age structures in the Economic and Social Commission for Asia and the Pacific region and their impact on demographic dividends, Ogawa et al. (2009) have found that for the region as a whole, the period of first demographic dividend is 1973–2023, and for India is 1975–2045. What emerges from our results is that India is predicted to enjoy the benefits of the first dividend until 2035.

Many scholars including Mason (2006) have suggested that to meet the challenges of population aging, developing countries like India should earnestly invest the first demographic dividend in human resources and institutions to build a viable asset-based retirement system. An important macroeconomic consequence of an aging population is the manner in which wealth is distributed and behaves over time during the transition. The components of wealth to consider are child rearing transfers ( $T_k/YI(-)$ ), pension wealth ( $Wp/YI$ ), assets ( $A/YI$ ), and consumption ( $C/YI$ ) relative to income shown in Figure 6 in terms of present values of future child rearing costs, pension wealth, assets, and consumption, respectively.

**Figure 6: Components of Wealth Accumulation Relative to Income in India, 2005–2295**



$A/YI$  = assets,  $WP/YI$  = pension wealth,  $Tk/YI(-)$  = child rearing transfers,  $C/YI$  = consumption,  $YI$  = labor income.

Source: Authors' calculations.



Child rearing costs in terms of relative wealth transfers to children were about four times annual labor income in 2005 and declined to 2.4 and 1.8 times in 2035 and 2070, respectively. The decline in child rearing costs in the late transition period is because fewer children are born when fertility rates are low. The relative cost still remains high because per-child consumption is expected to rise as the number of children falls. Pension wealth and assets rise substantially until 2070 coinciding with the second demographic dividend. Pension wealth is 4.2 times annual labor income in 2005 and rises to 5.5 times in 2070; the corresponding rise in assets is from 1.4 to 1.8 times annual labor income in this period. The demand for pension wealth is weak in the initial stages of the demographic transition due to a combination of factors including high child rearing costs, the predominance of young workers who are yet to start accumulating wealth for retirement, and a lack of incentives to save.

Bloom et al. (2010) note that a higher share in the working-age population is a supply-side opportunity for a potential economic boom but also acknowledge that this potential depends on how the extra workers are employed. This implies that the first demographic dividend does not arise merely because the working-age population increases. NTA-based calculations of the first demographic dividend capture contributions of public and private institutions and the policy environment through aggregate controls and age profiles of consumption and income variables and incorporate them in the computation of support ratios. Nevertheless, the constancy of cross-sectional age profiles of income and consumption throughout the computation is a limitation of the NTA approach.

## VI. Met and Unmet Challenges

From 2004 until 2010, India's average quarterly GDP growth was 8.40%, reaching an historical high of 10.10% in September of 2006 and a record low of 5.50% in December of 2004; the economy has posted an average growth rate of more than 7% in the decade since 1997 (Government of India, Ministry of Finance 2011). India's diverse economy includes traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of services. Services are the major source of economic growth, accounting for more than 50% of India's output while employing less than 33% of its labor force.

In a study of patterns and causes of economic growth in India, Basu and Maertens (2007) observed that while the Indian population has more than doubled since the 1960s, GDP has increased more than eightfold since then and gross domestic capital formation increased from 22.5% to 33% of GDP from 1980 to 2005. Bosworth and Collins (2007) broke the economic growth rate of India down into production, physical capital, land, education, and a residual called total factor productivity (TFP). The results of this study showed that the annual rate of change in output per worker increased from 3.3% in

1960–1973 to 5.8% in 1980–2005 while output per worker increased from 1.3% to 3.8% in 1960–1980 and 1980–2004. They concluded that post-1980 growth was associated more prominently with an increase in TFP. India's savings rate as a percentage of GDP has risen from 10% in the 1950s to 29.1% in 2004–2005 of which savings in the household sector constituted 1.9% and 10.3%, respectively (Ladusingh 2009). Though there is disagreement on the extent of poverty reduction from economic growth, Bhaskar and Gupta (2007) citing official estimates made by the planning commission, have mentioned that the percentage of the population below the poverty line fell from 37% to 27% in rural areas and from 33% to 24% in urban areas; and that overall, it fell from 36% to 26%.

Of major concern in India's growth paradigm are the widespread economic and social inequalities and the poor status of human development. These include the absence of food security for a significant proportion of the population; the inability to ensure basic needs of housing, sanitation, and adequate health care to the population as a whole; the continuing inability to ensure universal education and its poor quality; and the slow pace of increased access to education and employment across different social groups and women in particular (Ghosh 2008). Seen in this light, inclusive growth is a mirage. The growth rate in agriculture, which accounted for 18% percent of GDP in 2008, declined from 3.8% in 2006 to 2.6% in 2007, while the growth rate of industry, the major driver of the economy constituting 29% of GDP in 2008, slowed marginally in the same period (Jha and Mukhopadhyay 2007). The unemployment rate in rural India as a whole increased from 5.63% in 1993–1994 to 7.21% in 1999–2000 (Ghosh 2008).

## VII. Summary and Conclusions

Using the NTA framework, this paper estimates and offers evidence for the positive macro-economic implications of the age structure transition in India as quantified in the first and second demographic dividends. The estimates are based on the ESR and the consumption index. The ESR translates the economic life cycle as a measure of the first demographic dividend in terms of effective numbers of producers per consumer. Age patterns of per capita labor income and of consumption of public and private goods and services capture underlying individual preferences, intergenerational transfers, public policies, and market orientation. The ESR replaces the ad hoc total dependency ratio as a refined measure of the first demographic dividend. As the estimates of per capita age patterns of labor income and consumption are population weighted and constrained by macro aggregate controls, the ESR captures the economy of a country in a broader perspective.

The first demographic dividend predominates from 1980 to 2035, but from 2035 onward it dwindles and the second demographic dividend gains prominence. The total dividend

for India remains stable until 2070 as first dividend transfers to children relative to labor income gradually decline while pension wealth and asset accumulation relative to income steadily rise.

The link between the demographic dividends and income growth is policy-dependent. The first dividend is in part the consequence of the growing working-age population and can be realized only if employment opportunities expand to keep pace. The second dividend arises largely because prime working-age adults have to save to support longer retirements. To reap the economic gains of the potential second dividend, however, an environment conducive to accumulating assets is required. This is reflected in some of the policies and programs in India's Eleventh Five Year Plan. Our results offer strong empirical justification for strengthening these policies and programs as they will help to accomplish the plan's national economic growth target rate of 9%.

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### **About the Paper**

Laishram Ladusingh and M. R. Narayana find for India that income per effective consumer could increase by 24.9% from 2005 to 2035, of which 9.1% is from the first demographic dividend, and 15.8% is from the second demographic dividend; and that the second dividend will be stable up to 2070. However, the authors emphasized the need for policy reorientation to fully harness India's demographic dividends.


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